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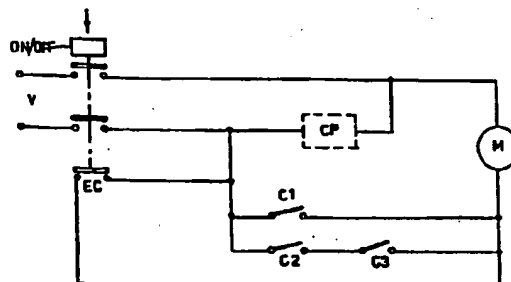
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I-10100 Torino(IT)**(54) **Programming device for a washing machine.**

(57) The present invention relates to a programming device for washing machines, in particular for dishwashers, able to control the execution of a plurality of different washing programs, comprising a mechanical cam system, controlled by means of command buttons; the characterising principle consists in the fact that the mechanical cam system is of the customary type and comprises a single operative motor.

**FIG. 3****EP 0 505 684 A2**

The present invention relates to a programming device for washing machines, in particular for dishwashers, able to control the execution of a plurality of different washing programs, comprising a mechanical cam system, controlled by means of command buttons.

There are known programming devices for washing machines as the type described; infact this solution is that currently utilised in dish washing machines of the higher class bracket, due to the ease of use with such program selection system.

Such buttoned programming devices normally comprise a mechanical cam system and two operative motors.

The first motor has the task of advancing the group of cams, so as to consent the selection of the various programs available through the mechanical cam system.

The mechanical cam system has the task of managing the course of the various programs or washing cycles, being of various duration and levels of complexity, obtained by a base program, complete in all the typical phases (pre-wash, wash, hot and cold rinse, drying, etc.). Each cam manages one or more phases or functions and therefore, according to the program selected, one or more cams are put into use. This mechanical cam system as far as the present invention is concerned will be defined as normal.

The second motor however has the task of making the programmer carry out different programs, for instance skipping phases and always utilising the mechanical cam system containing the base program. Even in the more traditional machines, controlled by means of a rotating dial, the selection of the various programs is obtained starting from the base program; in practice, therefore, the user in selecting the programs having a shorter duration has to change the beginning of the program, for instance rotating the dial to the point after the pre-wash, or in another successive point, according to the selected cycle.

So as to obtain the same level of performance in a mechanical system utilising buttons, the above mentioned second motor is used, which is a fast moving motor. The function of such is to let the group of cams proceed at a high speed, so as to skip, for instance, the pre-wash or other intermediate phases.

The incidence of the second motor, in terms of costs and complexity, is considerable, for this reason the total cost of the programming device and the breakdown risks are almost doubled compared to a single motor device: the logical consequence of which being that the total cost of the machine is increased and thus naturally leading to an overall increase in the price that the buyer has to pay

The invention is based on the knowledge of these facts and consequently its aim is to indicate a programming device for washing machines, of the type indicated, that overcome the inconveniences of the known programmers, being of simple realisation and maintenance, reliable and affordable.

To allow for such aims the present invention has as its object a programming device for washing machines, in particular for dishwashers, able to control the execution of a plurality of different washing programs, comprising a mechanical cam system, controlled by means of command buttons; the characterising principle consists in the fact that the mechanical cam system is of the customary type and comprises a single operative motor.

Further aims and advantages of the present invention will result in being clear from the detailed description that follows and from the annexed drawings supplied as a non-limiting example, wherein:

figure 1 represents the control panel of the programmer according to the invention;

figure 2 schematically represents an example of programs available with the programmer according to the invention;

figure 3 represents the electrical diagram of the activating system of the programmer according to the invention;

figure 4 represents the electrical diagram of the activating system of the programmer according to a variant of the invention

figure 5 represents the time diagram of the activating system of the programmer according to the invention;

figure 6 represents the time diagram of the activating system of the programmer according to a variant of the invention.

With reference to figure 1, in which the control panel of the programmer according to the invention is represented, particularly in the case of a dishwashing machine, five command buttons are to be noted, respectively distinguished with the symbols ON/OFF, +, E, A, R. The ON/OFF button is the button for turning on and off the machine (main switch); by depressing only such switch the machine will carry out the standard complete wash (or base program).

The other buttons, that for their utilisation naturally suppose that the machine has been turned on by means of the ON/OFF button, have the following functions:

- button + is the button to be depressed for obtaining the intense wash program, proposed for very dirty dishes;
- button E is the button to be depressed for obtaining the economic wash program, that saves both water and electrical energy;
- button A is the button to be depressed for

obtaining the dish pre-rinse program;

- button R is the button to be depressed for obtaining the quick wash program.

Still with figure 1, to the right of the buttons, a window is represented that displays a mobile index of the cycle's progress; such index is associated to the mechanical programming system. Below the window, in correspondence with the axis of the programmer, a slot F is provided, that allows for a service key to be introduced for the rapid advancement of the programmer, in the case of trials, controls and inspections during a service of technical assistance. Such slot is closed with a snap cover or by other known means, that can be removed when necessary.

In figure 2 there are schematically represented the programs available with the programmer according to the invention; the first line represents the phases carried out during the complete standard program, that comprises a cold pre-wash phase (PF), a wash phase at 65° (L 65), an initial cold rinse (1F), a second cold rinse (2F), a third hot rinse at 65° (3C) and a final drying phase (D); beside the first line the ON/OFF button is indicated, as mentioned above, the depressing of such button, apart from turning on the machine, activates said standard program.

The second line represents the phases carried out during the intensive program, that is composed of a hot pre-wash phase (PC), a wash phase at 65° (L 65), an initial cold rinse (1F), a second cold rinse (2F), a third hot rinse at 65° (3C) and a final drying phase (D); beside the second line, apart from the ON/OFF button, the + button is also indicated, that has to be depressed for activating such intense program.

The third line represents the phases carried out during the economic program, that comprises a cold pre-wash phase (PF), a wash phase at 55° (L 55), an initial cold rinse (1F), a second hot rinse at 55° (2C) and a final drying phase (D); beside the third line, apart from the ON/OFF button, the button E is also indicated, that has to be depressed for activating such economic program.

The fourth line represents the course of the pre-rinse program, that is composed of only a pre-rinsing phase; beside the fourth line, apart from the ON/OFF button, button A is also indicated, that has to be depressed for activating such pre-rinsing program.

The fifth line represents the washing phases carried out during the quick wash phase, that is composed of a wash phase at 55° (L 55), a single hot rinse phase at 65° (1C) and a final drying phase (D); beside the fifth line, apart from the ON/OFF button, button R is also indicated, that has to be depressed for activating such quick wash program.

It may now be considered how the five programs described are obtained, utilising a normal mechanical cam system, provided with a single operative motor, and five buttons for selecting the programs.

The mechanical cam system is of the normal type, that does not provide however electromagnetic commanded ratchet gears, comprising a group of cams that allow for the carrying out of all the wash phases normally provided for (pre-wash, wash, three rinses and drying) and that with simply activating the ON/OFF button the standard program can be carried out (first line of fig. 2).

Said group of cams provide for a first supplementary cam that causes an arrest during the cold pre-wash; said first supplementary cam is activated by depressing button A and therefore is utilised only in the case of the pre-rinse program.

The group of cams also provides for a second supplementary cam for the execution of the hot pre-wash; said second supplementary cam is activated by button +, in the case of selecting the intensive program. The same group of cams also provides for a third supplementary cam for carrying out the washing at 55° instead of 65°, that can be activated with the buttons E and R, during the course of the respective programs selected, and a fourth supplementary cam, activated with button E, for preventing a cold rinse.

Finally the grouped cam provides for a fifth supplementary cam, activated with button R, that prevents drainage of and filling with water between the pre-wash and wash and in correspondence with the second and third rinse; in a possible variant the drying phase could also be prevented.

As can be easily observed the five described programs can be obtained, without the necessity of a second motor or of complicated and costly ratchet gears.

As explained, the pre-rinsing program, that consists of a rapid rinsing of the dishes, is obtained through the utilisation of a cam that causes an arrest of a phase substantially similar to the rinsing itself, in other words the (cold) pre-wash. In the case in which the pre-rinse program is carried out, therefore, the cycle selected successively will start not at its own beginning, but at the end of the former rinsing cycle; however, in practice, the pre-wash of the selected cycle will result in being shorter, but of such an extent being absolutely negligible.

For this reason it is not possible to carry out two pre-rinsings consecutively, but in reality this case never occurs, being that the pre-rinse program is simply used to postpone the washing of a few dishes until the end of successive meal.

From the given description it is evident that with the aid of supplementary cams 5 different

programs can be obtained, yet exploiting a single principle programming system.

The problem is still to be solved of resetting the group of cams in its initial position before commencing a new wash cycle.

In figure 3 the electrical diagram of the activating system of the programmer according to the invention is represented, that also provides the solution to this problem.

In figure 3 the symbol V indicates the electrical voltage of the mains input; ON/OFF indicates the activating switch, that activates or disactivates both phases of the mains; the symbol EC indicates an extra-course contact that has the task of activating the operative motor (M) of the programmer short-circuiting the cams, indicated with the reference symbols C1, C2, C3.

Reference symbol CP indicates the group of cams of the programmer of which, for ease of representation and understanding, the cams C1, C2 and C3 have been placed externally. It is to be underlined that said cams are not the 4 mentioned supplementary cams, but are other cams, two of which (C2 and C3) are additional. In particular:

- cam C1, that is normally provided for inside the group cam of every programmer, is a customary slow rotation cam, whose function is to activate, in the known way, the motor (M) of the programmer during the various cycles of the wash cycle.
- cam C3 is a normal fast cam, i.e. of continuous motion obtained directly by the operative motor (M) of the programmer, by means of a speed reducing gear (for example said cam completes a revolution every 60 seconds). Cam 3 has the function of activating the motor (M) of the programmer during the final impulse before the termination of the washing cycle, in substitution of cam C1, and then to interrupt the input of the motor (M) and arrest all other functions of the machine upon termination of the cycle before the commutation of the slow cam C2.
- Cam C2 is a normal slow rotation cam, similar to cam C1, i.e. with a click motion obtained by means of simple ratchet gear systems, that causes a release of the slow cam every revolution of the fast cam (therefore, with reference to the example above, with intervals of 60 seconds). The only task of cam C2, placed in series to cam C3, is to disactivate cam C3 so as to avoid that it hinders the activation of the motor of the programmer, when this is under the control of cam C1. The operational interruption of cam C1 occurs upon the final impulse of the program before termination of the final cycle; 1a substitution of cam C1 with cam C3 (and C2),

in the activation function of the motor of the programmer, is necessary for the reason of having available at the end of the washing cycle an impulse, i.e. an interval between the opening and closure of the contacts, lasting a few seconds.

Said impulse of a few seconds is obtainable only through a fast cam (C3) because, as previously mentioned, the fast cams are of a continuous motion and complete a revolution every 60 seconds; therefore they can be shaped so as that the impulse corresponding to a revolution be divided as desired (in the present 58 seconds open and 2 seconds closed). Something that is not obviously possible to reach with a slow cam, as between the opening and closure of the contacts (or vice versa) that it activates with one of its clicks, a rotation time equal to a complete revolution of the fast cam elapses (60 seconds).

The division of the functional tasks during the final impulse serves therefore in re-setting the programmer in a short time from the position of cycle termination to the initial position for beginning another cycle.

Therefore upon termination of any program, apart from that of pre-rinse, the condition of the cams of figure 3 are as follows: C1 open, C2 closed and C3 open, as can be seen from figure 5, where the closed cams are represented black and those open in white while the vertical lines delimit the 60 second impulses of the slow cams.

A new washing program can be initiated by depressing the button corresponding to the selected program; for selecting the standard program it is sufficient to depress the ON/OFF button, while for selecting another program two buttons are to be depressed: the ON/OFF button (turning on/off) and the button corresponding to the selected program. Closing the ON/OFF switch, the extra-course EC is also automatically closed, due to the effect of the finger pressure applied, that activates in this manner the motor (M) of the programmer, which then rotates and in turn rotates the fast cam C3 until the commutation click of the slow cam, that indicates the beginning of the cycle.

Consequently said fast cam C3 rotates and the slow cams C1 and C2 simultaneously rotate thus causing the closure of the contacts of cam C1 and the opening of the contacts of cam C2: in this way the activation of the motor (M) of the programmer is transferred to cam C1. Therefore the programmer is brought back to the position of the beginning of the cycle.

So as to have a sufficient interval of time for causing the commutations of cams C1 and C2, it is necessary that there is a continuous input to the motor of the programmer, this is obtained by keeping the ON/OFF button depressed, with the con-

sequent closure of the extra-course EC contact, for a 2 to 4 second period.

At this point the machine has started and the ON/OFF switch can be released, which opens the EC contact leaving the supply contacts of the machine closed.

The motor of the programmer will continue to receive current from cam C1, until the beginning of the final impulse of the selected program. The user will be informed of the beginning of the cycle or the starting of the machine by the mobile index visible through the window of the control panel, beside the buttons. Furthermore, the beginning of the cycle or the starting of the machine may be made even more evident using an indication light or an acoustic signal.

The described command system therefore allows for the re-setting of the programmer from the point of the end of cycle to the starting point, an operation that in devices utilising a rotating dial is carried out manually by the user and with programmers having traditional buttons can only be obtained with electromagnetic ratchet gears or a second fast operational motor.

It is clear that numerous variants of the device of the present invention are possible, one of which could be that represented in figure 4.

In figure 4 the electrical diagram of the activating system of the programmer according to a variant of the invention is represented; with the reference symbol V the electrical voltage of the mains supply is indicated; the symbol ON/OFF1 indicates the on or off switch (having substantially the same functions as the button ON/OFF), that activates or deactivates both phases of the mains; the symbol EC indicates an extra-course contact, that has the task of activating a relay R, this being a relay of the cyclic type, whose contact is to be found in series with the contacts of the switch ON/OFF1 and the motor (M) of the programmer; symbol CP indicates a group of cams of the programmer of which, for ease of representation and understanding, the cams C4, C5, C6, C7 and C8 have been placed externally.

Cam C5 is a slow cam and has the task of activating the motor (M) of the programmer during the various phases of the wash programs; cams C4 and C7 are two fast cams placed in series with two slow cams C8 and C6 (the cams C4, C5, C6, C7 and C8 are consequently additional cams).

Said relay R, has the characteristic of keeping the contacts open or closed in a permanent manner, even in voltage loss at the command winding, in such a way that every voltage impulse corresponds to a state of closure or opening of the contacts in an alternative sequence.

The ON/OFF1 switch comprises a known electromagnetic release system so as that, upon ter-

mination of the wash cycle, a voltage impulse commanded by the programmer through the fast cam C4, causes the release of the switch and the consequent switching off of the machine. The slow cam C8 has the task of deactivating cam C4, in avoiding that the latter interrupts the release system of the ON/OFF1 switch before the cycle has finished.

The function of cam C7 is to supply an electrical impulse to the winding of the relay for opening the contacts, after the programmer has closed the contacts of cam C5 and passed under its control.

Cam C6 has the task of deactivating cam C7 in avoiding that every revolution of the latter continues to supply the winding of the relay R, with consequent closure and opening of the contacts upon every revolution, and that it continues to interfere in the activation of the motor of the programmer taking supply control from the cam C5.

The functioning of the activating system of the programmer according to a variant of the present invention is the following.

For starting a wash program the button corresponding to the selected program is depressed; in selecting the standard program it is sufficient to depress the ON/OFF1 button, while for selecting another program two buttons have to be depressed: the ON/OFF1 button (for turning on) and the button corresponding to the program to be selected.

By depressing the ON/OFF1 button, apart from closing the contacts of the main supply line, the extra-course contact EC is also momentary closed, which causes activation of the relay R, whose cyclic element rotates in such a manner so as to close the contact and thus activate the motor of the programmer.

The task of the relay R however is in avoiding that the user has to keep the ON/OFF1 button depressed for a predetermined period of time, as was necessary in the solution demonstrated in figure 3.

The motor of the programmer, supplied by relay R, begins to revolve and causes the group of cams to rotate, causing the closure of cam 5 that indicates the beginning of the wash cycle.

In this way, the resetting of the programmer from the stop position to the starting cycle position is which it is to be found, to the beginning of the cycle position can be achieved without having to intervene manually on the programmer.

At this point allowance is made for the programmer to be managed only by cam C5 and the relay R no longer interferes upon the programmer, once that the starting of the washing program has been carried out. This task is accomplished by cams C6 and C7, in fact upon the closure of cam

C5 the simultaneous closure of cam C6 takes place and, with the immediate successive closure of the fact cam C7, an electrical impulse is sent to the relay R, whose cyclic element rotates in a manner that opens the contact and leaves the supply control of the motor of the programmer completely to cam C5 until the the end of the washing cycle. Further closures of the contact of cam C7 will be ineffective, as in the meantime, as demonstrated in figure 6 cam C6 has opened.

The operational times of the cams and the extracourse contacts and of the relay, can be observed in figure 6 that represents the times diagram of the activation system according to this variant of the invention.

In said diagram the interval between the vertical lines represents the 60 second impulse of the slow cams the black sections the closure times.

The task of the ON/OFF1 button provided with electromagnetic release is that of removing the supply from the entire machine at the end of the washing cycle, without the necessity of the user having to depress the button a second time; in fact if for turning the machine off and resetting the ON/OFF1 button to a position ready for turning the machine on again, a second depressing of the button were necessary, after that carried out for starting the machine, such a second depression would re-activate the extracourse contact EC which would close the the contact of the relay R, so that when the comand for beginning a new washing cycle be called for, the relay would not be able to start the motor M and move, as a consequence the group of cams, because an electrical impulse to the relay R would open the contact instead of closing it.

For avoiding this at the end of a washing cycle the cams C4 and C8 are closed, that activate the electromagnetic release of the general switch, thus causing the arrest of the machine and the correct positioning of the ON/OFF1 button (open position) and leaving the contact of relay R in an open position so as to be operative upon turning the machine for future use.

The characteristics of the programming device described result in being clear from the detailed description and annexed drawings.

From the detailed description, the practical advantages of the programmer object of the present invention also become clear.

In particular the described device allows for obtaining a plurality of washing programs by means of control buttons, utilising a normal mechanical cam programmer, without the use of a second motor or complex ratchet gears.

It is clear that other variants are possible to the programming device object of the present invention.

One of these could be that of grouping the five buttons in a single push button panel, facilitating the assembly of the buttons on the machine.

A further variant could relate to the button command system. In fact as previously described, for the selection of any one of the programs (not being the standard program) the ON/OFF or ON/OFF1 button must be depressed and the button relating to the particular selected program: According to this further variant, the push button panel of the program selecting buttons be realised in such a way that by selecting any one of the programs (not being the standard program), the pression on the corresponding key, causes the release of the button relating to the last program utilised. In this way it is not possible to keep two buttons depressed for selecting programs simultaneously.

It is clear that numerous other variants are possible by the man of the art, to the programming device described as an example, without however departing from the novelty principles inherent in the invention.

Claims

1. Programming device for washing machines, in particular for dishwashers, able to control the execution of a plurality of different washing programs, comprising a mechanical cam system, controlled by means of command buttons, characterised by the fact that the mechanical cam system is of the normal type and comprises a single operative motor (M).
2. Programming device for washing machines, according to claim 1, characterised by the fact that said command buttons comprise an on off switch (ON/OFF; ON/OFF1) which, if operated alone, provides for activating said mechanical cam system for obtaining the execution of a washing program comprising standard washing phases.
3. Programming device for washing machines, according to claim 2, characterised by the fact that the other command buttons (+, E, A, R) are coupled to supplementary cams of said mechanical cam system.
4. Programming device for washing machines, according to claim 3, characterised by the fact that one (+) of said command buttons, by means of a supplementary cam to which it is coupled, provides for heating the water during the pre-wash phase.
5. Programming device for washing machines, according to claim 3, characterised by the fact

that one (E) of said command buttons, by means of a supplementary cam to which it is coupled, provides for selecting a determined temperature for the washing phase.

6. Programming device for washing machines, according to claim 3, characterised by the fact that one (E) of said command buttons, by means of a supplementary cam to which it is coupled, provides for preventing the execution of a cold rinse phase.
7. Programming device for washing machines, according to claim 3, characterised by the fact that one (A) of said command buttons, by means of a supplementary cam to which it is coupled, provides for arresting the washing cycle after only a part of the pre-wash phase has been carried out.
8. Programming device for washing machines, according to claim 3, characterised by the fact that one (R) of said command buttons, by means of a supplementary cam to which it is coupled, provides for preventing the drainage of and filling with water between the pre-wash and wash phases and for selecting a determined wash and rinse temperature.
9. Programming device for washing machines, according to claim 3, characterised by the fact that one (R) of said command buttons, by means of a supplementary cam to which it is coupled, provides for preventing the drainage of and filling with water between the rinsing phases.
10. Programming device for washing machines, according to claim 3, characterised by the fact that one (R) of said command buttons, by means of a supplementary cam to which it is coupled, can prevent the drying phase.
11. Programming device for washing machines, according to claim 2, characterised by the fact that said on off switch (ON/OFF; ON/OFF1) comprises an extra-course contact (EC) for commanding the return means that provide for the re-setting of the mechanical system from the end of cycle point to the point of the cycle's beginning.
12. Programming device for washing machines, according to claim 11, characterised by the fact that said return means comprise a slow cam (C2) and a fast cam (C3) that manage the driving of a motor (M).

13. Programming device for washing machines, according to claim 11, characterised by the fact that said means comprise a relay (R), equipped with a rotating cyclic element, which closes a contact and causes the driving of the mechanical system to the point of the cycle's beginning.
14. Programming device for washing machines, according to claim 13, characterised by the fact that release means (C6 and C7) are provided for that after the beginning of the cycle provides for setting the relay (4) in a rest position, fit for a successive intervention when, the washing has been carried out, it is desired to re-activate the machine.
15. Programming device for washing machines, according to claim 2, characterised by the fact that said on off switch (ON/OFF; ON/OFF1) is equipped with an electromagnetic release commanded by the programmer upon the termination of the cycle.
16. Programming device for washing machines, according to claim 11, characterised by the fact that indicating means for making evident the cycle's beginning are provided for.
17. Programming device for washing machines, according to claim 16, characterised by the fact that said indicating means can be visible, luminous or acustic.
18. Programming device for washing machines, according to claim 1, characterised by the fact that means are provided for enabling access to the programmer.
19. Programming device for washing machines, according to claim 1, characterised by the fact that said means consist of a slot (F) and a relative closing cover.
20. Programming device for washing machines, according to claim 1, characterised by the fact that said command buttons are comprised in a control panel that provides release means when another button belonging to the same control panel is depressed.

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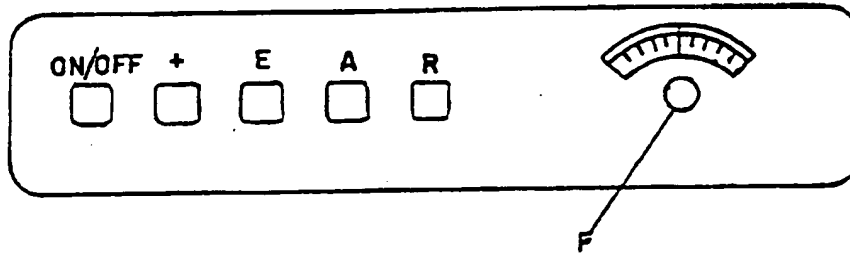


FIG. 1

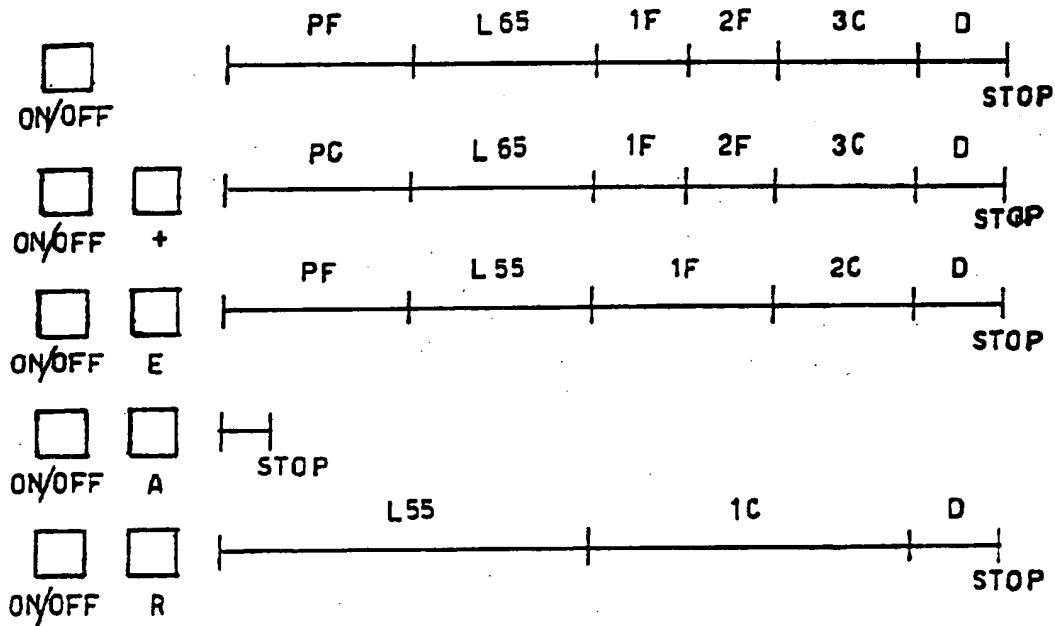


FIG. 2

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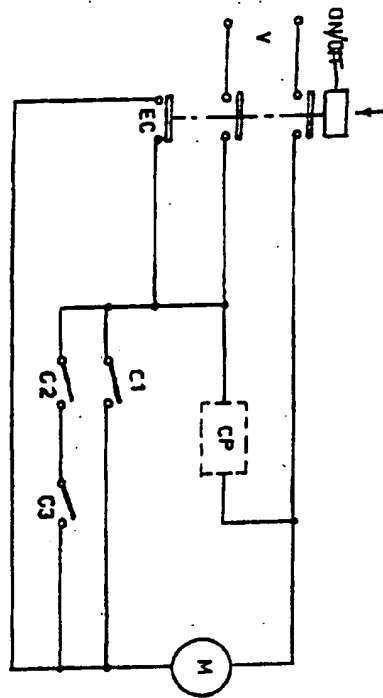


FIG. 3

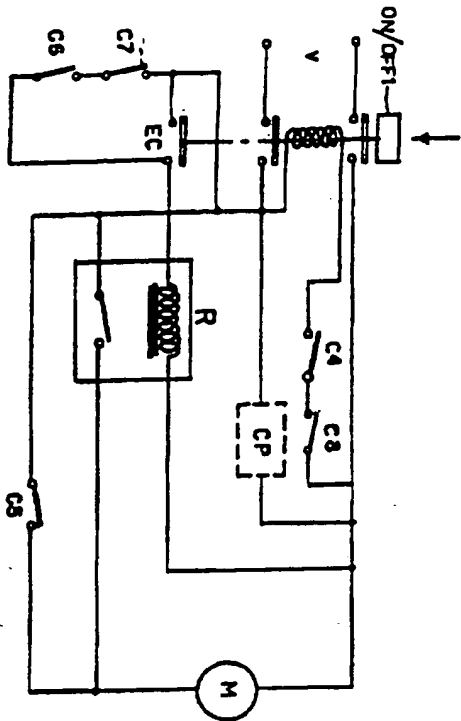


FIG. 4

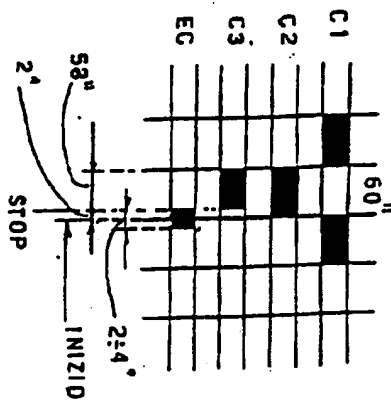


FIG. 5

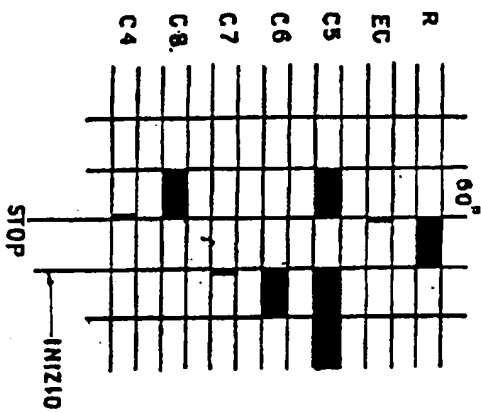


FIG. 6